ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies

Region: Gulf of Mexico

Planning Area(s): Western and Central

Title: Exploration and Research of Northern Gulf of Mexico Deepwater Natural and Artificial Hard Bottom Habitats with Emphasis on Coral Communities: Reefs, Rigs and Wrecks

BOEM Information Need(s) to be Addressed: Knowledge of the distribution and sensitivity of unique biological habitats in deep water is necessary for management decisions. Study results will help to further refine current mitigations and need for avoidance of hard bottom areas in deepwater. There is also a need to understand the ecological role of deepwater platforms or other deepwater oil and gas related structures serving as artificial reefs in the Gulf of Mexico in order to make decisions regarding decommissioning. Inclusion of shipwrecks as additional artificial reef areas will also meet information needs for identification of unknown sites and increase understanding of metal corrosion rates.

Period of Performance: FY 2008-2015

Description:
Background: It is well known that there are many locations with significant areas of hard bottom in the deep Gulf of Mexico, particularly associated with faulting above the tops of salt diapirs. These hard bottom areas are generally created through biogenic precipitation of carbonate by chemosynthetic bacteria. Carbonate deposits can subsequently become exposed above surrounding slope sediments providing substantial substrate for attached animal communities to develop. These areas are well represented on 3D seismic surface anomaly geophysical maps used during the biological review process of potential impacts from proposed drilling operations or pipeline installations. An initial study has demonstrated the presence of numerous deepwater coral communities in the deep Gulf of Mexico but information is lacking for informed decisions regarding distribution and sensitivity to impacts.

The previous *Lophelia* study, *Characterization of Northern Gulf of Mexico Deepwater Hard Bottom Communities with Emphasis on* Lophelia *Coral* (*Lophelia* I; (Continental Shelf Associates, in prep)) was an important step in gaining knowledge of previously unknown sensitive biological features in the deep Gulf of Mexico. This study and final report will be completed and released in May or June 2007. Deepwater corals have become an increasingly significant habitat and area of study throughout the world.

The initial study, *Lophelia* I has proven to be very enlightening and successful as far as it was capable of progressing with the field time allowed by that project's limited budget. Significant unanswered questions and new directions have become evident from the results of the initial study. Focused studies and process-oriented research will be necessary to further develop an understanding of the distribution of deep coral habitats.

Of particular significance is determining the probability of where high-density coral communities will be found on exposed hard bottom substrate.

As an additional aspect of hard bottom habitat, this next phase has been expanded to include artificial reefs created by both oil and gas structures in deepwater as well as shipwrecks. Initially, a separate study named *Deepwater Artificial Reef Effect II* (a follow up to the WWII shipwreck study; Church et al. 2007) was scheduled for a single year's field work to look at older deepwater platforms. This profile now merges the DARE II objectives with the *Lophelia* II study that has been deferred from 2007 procurement to 2008.

It is generally accepted that artificial reefs can serve a positive function by the creation of new hard bottom habitats in areas where hard bottom is naturally lacking (most of the Gulf of Mexico). In the case of fish, artificial reefs can act both as attraction devices and as new habitats where new fish biomass is created and exported, meaning production. The fouling community growing on new hard bottoms provided by artificial substrate is unquestionably new production for those organisms that require hard substrate. The trophic linkages between the flux of organic material to deepwater fouling communities and potentially related fish communities are not well understood.

There are now numerous industry-related structures at water depths below 1,000 ft in the Gulf. The use of sub-sea completions on the sea bed is rapidly increasing. The number of sub-sea completion installations has risen from just four in 1990 to 51 in 2001, and nearly three fourths of these occurred in deepwater (>1,000 ft). A total of 102 were installed in deepwater between 2000 and 2003. Examples of extraordinary solid platforms include the Cognac and Bullwinkle platforms in 1,023 and 1,353 ft of water respectively. Bullwinkle has now been in place for 17 years and Cognac for 26 years. A third structure, the Pompano platform at a water depth of 1,430 ft in block VK 989 has already been documented to have *Lophelia* coral growth on parts of its structure and it was only nine years old at the time of those observations. In Green Canyon Block 184, an EA has already been completed for the removal of the Gulf's first tension leg platform at a water depth of 1,762 ft. The operator, ConocoPhillips requested that they be allowed to leave the massive template on the seabed. There is a good possibility that this structure is colonized by deepwater corals that are known to exist at the nearby chemosynthetic community Bush Hill in GC 185.

In the near future, decisions will be required for the removal of structures located in water depths beyond the continental shelf. Current guidelines outlined in 30 CFR Part 250.1728 allow the BOEM Regional Supervisor to approve alternate plans for removal of structures when the water depth is greater than 2,624 ft (800 m). Options for removal at shallower depths have previously relied on the concept that the structure left behind would serve as a positive fisheries enhancement or other beneficial environmental function. The BOEM now has a direct need for information that will help describe any significant ecological role (if any) that man-made structures may have in deepwater of the Gulf of Mexico. A recent study "*Archaeological and Biological Analysis of World War II Shipwrecks in the Gulf of Mexico: Artificial Reef Effect in Deepwater"* (Church et al., 2007) first approached this subject. This project was in effect DARE I but looked

specifically at older man-made structures represented by shipwrecks. Remarkable discoveries were made on some of the shipwrecks investigated during this project. One wreck was particularly significant, the *Gulfpenn* sunk in 1942, which provided a known recruitment time of 62 years. Numerous large colonies of *Lophelia* coral were discovered growing on the wreck located at a depth of 1,820 ft.

Objectives: The purpose of this follow-up study is to focus on remaining questions that will define environmental conditions that result in the observed distribution of significant high-density hard bottom communities that are sensitive to impacts from oil and gas development activities (especially extensive areas of *Lophelia* coral). The use of artificial reefs of all kinds including platforms and shipwrecks (man-made hard bottom) should be utilized to enhance the understanding of variables controlling zoogeography. The additional objectives of this combined study will be to further explore the basic question, "Do man-made artificial structures function as artificial reefs in deep water?" Additional objectives also include the investigation of previously unexplored shipwrecks of the deep Gulf as well as returning to previously visited WWII wrecks to recover ongoing experiments.

Methods: Similar to the previous *Lophelia* I study, this project may require the use of a manned submersible for the fine scale observation and sample collections required to describe new, high-diversity biological communities. A high-end Remotely Operated Vehicle (ROV) could also fulfill most, if not all study needs. ROVs will likely be necessary for the shipwreck aspects due to the danger of entanglement for manned submersibles. In addition, it is expected that a number of collaborations will continue with USGS. Some complimentary elements of this project will be conducted by investigators from various USGS locations resulting in cost sharing benefits for many investigators and broader approaches to additional ecological disciplines. This project is also anticipated to be sponsored by the National Oceanographic Partnership Program (NOPP) and partnering with the National Oceanic and Atmospheric Administration's Office of Ocean Exploration for cost sharing of submergence and research vessel facilities during some, or possibly all of the field sampling years.

Status: All field work has been completed and a draft final report has been submitted. Review is nearly complete and will be sent to the contractor for final editing. Completion and publication to ESPIS is expected in 2015.

Revised Date: February 24, 2015